HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Baker Lake Coho
Species or Hatchery Stock:	Baker River Coho
Agency/Operator:	Washington Department of Fish and Wildlife and Puget Sound Energy
Watershed and Region:	Skagit River North Puget Sound
Date Submitted:	March 17, 2003
Date Last Updated:	April 23, 2003

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Baker Lake Coho

1.2) Species and population (or stock) under propagation, and ESA status.

Baker River Coho – not listed

1.3) Responsible organization and individuals

Indicate lead contact and on-site operations staff lead.

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

Puget Sound Energy (PSE): Provides funding for the program as directed by the Baker River Committee (WDFW, PSE, Skagit System Cooperative, USFWS, USFS, NPS (National Park Service) and NMFS)

1.4) Funding source, staffing level, and annual hatchery program operational costs.

Puget Sound Energy (PSE) provides full funding for the hatchery program to support 4 full time PSE staff and one WDFW staff. PSE also provides funding to support a WDFW Fish Health Specialist.

1.5) Location(s) of hatchery and associated facilities.

The Baker trout pond complex (owned by PSE) is located on the Baker River, a Skagit River tributary (WRIA 3 & 4). The facilities consists of an adult trap at River Mile (RM) 0.5 , two 8' by 100' raceways, 5 circulars, two intermediates, an asphalt rearing pond, and a facility infrastructure which supports the program. Water for the ponds is from a spring fed creek, just below the Baker Dam and at the very head end of Lake Shannon (RM 9).

1.6) Type of program.

Integrated harvest and research.

1.7) Purpose (Goal) of program.

The purpose of this program is to supply experimental and research smolts for gulper efficiency testing, serve as an indicator stock for wild Skagit coho, and supplement natural production in the basin.

1.8) Justification for the program.

This program provides a research element not available from sockeye due to IHNV.

1.9) `List of program "Performance Standards".

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

Performance Standards and Indicators for Puget Sound **Integrated Harvest** sockeye programs.

Performance Standard	Performance Indicator	Monitoring and Evaluation Plan
Produce adult fish for harvest	Survival and contribution rates	Monitor catch and measure survivals by periodical age composition analysis.
Meet hatchery production goals	Number of juvenile fish released – **See section 1.11.2**	Estimating number of fish planted (weighing / counting fish), monitoring proximity to hatchery production goals, number released recorded on hatchery divisions "plant reports", data available on WDFW data base. Future Brood Documents.
Manage for adequate escapement	Hatchery and wild return rates Catch rates	Monitoring hatchery/wild return rates through trapping at the hatchery trap.

Minimize interactions with listed fish through proper broodstock management.	Total number of broodstock collected – **goal is 200 adults**	Measuring number of fish actually spawned and killed to meet egg take goal at the hatchery. Hatchery Records. Hatchery Records Start trapping prior to historical start of the run, continue trapping throughout the run, dates and times are recorded on hatchery divisions "adult reports", data available on WDFW data base. Hatchery records Hatchery records Hatchery records Spawning guidelines
	Sex ratios	
	Timing of adult collection /spawning – **September/October through December**	
	Number of listed fish returned to the river. – **Unknown**	
	Hatchery stray rate	
	Number wild fish used in broodstock –**random collection**	
	Return timing of hatchery / wild adults – **September to December/January**	
	Adherence to spawning guidelines	

Minimize interactions with listed fish through proper release strategies	Juveniles released as unfed fry – **see section 1.11.2**	Future Brood Document (FBD) and hatchery records Hatchery records and historical natural out-migrant data FBD and hatchery records CWT data and mark / unmarked ratios of adults
	Outmigration timing of listed fish / hatchery fish **– early May / June**	
	Size and time of release **- 500-700 fpp in April/May and 17 fpp in June**	
	Hatchery stray rates	
Maintain stock integrity and genetic diversity	Effective population size	Spawning guidelines Spawning ground surveys (if wild spawners)
	Hatchery-Origin Recruit spawners	
Maximize in-hatchery survival of broodstock and their progeny; and Limit the impact of pathogens associated with hatchery stocks, on listed fish	Fish pathologists will monitor the health of hatchery stocks on a monthly basis and recommend preventative actions / strategies to maintain fish health	Co-Managers Disease Policy Fish Health monitoring records
	Fish pathologists will diagnose fish health problems and minimize their impact	
	Vaccines will be administered when appropriate to protect fish health	
	A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings	

	Fish health staff will present workshops on fish health issues to provide continuing education to hatchery staff.	

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

200 adults (1:1)

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location. (*Use standardized life stage definitions by species presented in* Attachment 2).

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry	Sulphur Creek	Up to 120,000
Fingerling		
Yearling	Baker Lake, Lake Shannon and at the mouth of the Baker	10k Baker Lake, 5k Lake Shannon remainder ,up to 45k, at the mouth of the Baker

- This program is evaluated annually by the Baker River Committee.

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

1.13 Date program started (years in operation), or is expected to start.

1983

1.14) Expected duration of program.

This program is ongoing and is expected to continue long-term.

1.15) Watersheds targeted by program.

The Baker River, tributary to the Skagit River, WRIA 3 & 4.

1.15) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

If IHNV in the Baker River Sockeye could be minimized or eliminated it would be possible to use sockeye smolts as gulper efficiency test fish and not as many coho.

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.

None

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

- Identify the ESA-listed population(s) that will be directly affected by the program.

- Identify the ESA-listed population(s) that may be incidentally affected by the program.

Lower Skagit/MS Trib Fall Chinook

One fall chinook stock exists in the Skagit, spawning in the lower mainstem and in Baker River, Finney Creek and Day Creek. Fall chinook spawning begins in the second week of September, peaks in early October and continues through October.

Suiattle Spring Chinook, Upper Cascade Spring Chinook, Upper Sauk Spring Chinook, Lower Sauk Summer Chinook, Upper Skagit Summer Chinook and Bull Trout/Dolly Varden.

2.2.2) Status of ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds (*see definitions in "Attachment 1").*

Critical and viable population thresholds under ESA have not been determined, however, the SASSI report (WDFW) determined this population (lower Skagit Fall Chinook) to be "depressed".

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

No tag returns at this time to assess survivals.

- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Brood Year	Est Females	Potential Eggs*	Total Smolts	Survival to Migration
1989	3274	14.7 million	963,930	6.5%
1990	8468	38.1 million	233,603	0.6%
1991	2923	13.2 million	1,777,330	13.5%
1992	3598	16.2 million	2,142,078	13.2%
1993	2793	12.6 million	1,436,530	11.4%
1994	2847	12.8 million	1,310,448	10.2%
1995	3465	15.6 million	414,691	2.7%

* at 4,500 eggs/female

Source: WDFW trapping data

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

NA

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take

Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

Coho broodstock collection has a "low" potential to take listed wild Skagit chinook salmon and/or Bull Trout through migrational delay, capture, handling, and release during trap operation at the Baker River trap between September/October and December. Trapping and handling devices and methods may lead to injury to listed fish during migration through de-scaling, delayed migration and /or delayed mortality as a result of injury or increased susceptibility to predation. All unmarked chinook trapped up to August 15 will be transported to Baker Lake. Unmarked chinook from August 15 to October 10 will be returned to the Skagit River. After October 10 unmarked chinook may be taken to the Marblemount Hatchery to be used for fall chinook broodstock/egg take. Before September 15, all CWT'd chinook will have their tags extracted and read at the trap until a Skagit summer or fall chinook tag is recovered. After September 15 all chinook with CWT's will be transported to the Marblemount facility.

The release of fish as described in this HGMP could potentially result in ecological interactions with listed species. These potential ecological interactions are discussed in Section 3.5, and risk control measures are discussed in Section 10.11. Implementation of the program modifications provided in this HGMP, and the actions previously taken by the comanagers, are anticipated to contribute to the continued improvement in the abundance of listed salmonids.

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

Unknown

-Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

Unknown

-Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

None expected.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

Puget Sound Energy

Skagit System (Tribal) Cooperative

United States Forest Service

Puget Sound Management Plan

3.3) Relationship to harvest objectives.

3.3.1) Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

An in-river recreational harvest may be allowed if surplus adults are available.

3.4) Relationship to habitat protection and recovery strategies.

This program replaces spawning habitat lost due to the construction of two hydroelectric dams on the Baker River.

3.5) Ecological interactions.

The program described in this HGMP interacts with the biotic and abiotic components of the freshwater, estuarine, and marine salmonid ecosystem through a complex web of short and longterm processes. The complexity of this web means that secondary or tertiary interactions (both positive and negative) with listed species could occur in multiple time periods, and that evaluation of the net effect can be difficult. WDFW is not aware of any studies that have directly evaluated the ecological effects of this program. Alternatively, we provide in this section a brief summary of empirical information and theoretical analyses of three types of ecological interactions, nutrient enhancement, predation, and competition, that may be relevant to this program. Recent reviews by Fresh (1997), Flagg et al. (2000), and Stockner (2003) can be consulted for additional information; NMFS (2002) provides an extensive review and application to ESA permitting of artificial production programs.

Nutrient Enhancement

Adults originating from this program that return to natural spawning areas may provide a source of nutrients in oligotrohic coastal river systems and stimulate stream productivity. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmon have been found to elevate stream productivity through several pathways, including: 1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998); 2) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and 3) juvenile salmonids have been observed to feed directly on the carcasses (Bilby et al. 1996). Addition of nutrients has been observed to increase the production of salmonids (Slaney and Ward 1993; Slaney et al. 2003; Ward et al. 2003).

Predation – Freshwater Environment

Coho and steelhead released from hatchery programs may prey upon listed species of salmonids, but the magnitude of predation will depend upon the characteristic of the listed population of salmonids, the habitat in which the population occurs, and the characteristics of the hatchery program (e.g., release time, release location, number released, and size of fish released). The site specific nature of predation, and the limited number of empirical studies that have been conducted, make it difficult to predict the predation effects of any specific hatchery program. WDFW is unaware of any studies that have empirically estimated the predation risks to listed species posed by the program described in this HGMP.

In the absence of site-specific empirical information, the identification of risk factors can be a useful tool for reviewing hatchery programs while monitoring and research programs are developed and implemented. Risk factors for evaluating the potential for significant predation include the following:

Environmental Characteristics. Water clarity and temperature, channel size and configuration, and river flow are among the environmental characteristics that can influence the likelihood that predation will occur (see SWIG (1984) for a review). The SIWG (1984) concluded that the potential for predation is greatest in small streams with flow and turbidity conditions conducive to high visibility.

Relative Body Size. The potential for predation is limited by the relative body size of fish released from the program and the size of prey. Generally, salmonid predators are thought to prey on fish approximately 1/3 or less their length (USFWS 1994), although coho salmon have been observed to consume juvenile chinook salmon of up to 46% of their total length (Pearsons et al. 1998). The lengths of juvenile migrant chinook salmon originating from natural production have been monitored in numerous watersheds throughout Puget Sound, including the Skagit River , Stillaguamish River, Bear Creek, Cedar River, Green River, Puyallup River, and Dungeness River. The average size of

migrant chinook salmon is typically 40mm or less in February and March, but increases in the period from April through June as emergence is completed and growth commences (Table 3.5.1). Assuming that the prey item can be no greater than 1/3 the length of the predator, Table 3.5.1 can be used to determine the length of predator required to consume a chinook salmon of average length in each time period. The increasing length of natural origin juvenile chinook salmon from March through June indicates that delaying the release hatchery smolts of a fixed size will reduce the risks associated with predation.

Table 3.5.1. Average length by statistical week of natural origin juvenile chinook salmon migrants captured in traps in Puget Sound watersheds. The minimum predator length corresponding to the average length of chinook salmon migrants, assuming that the prey can be no greater than 1/3 the length of the predator, are provided in the final row of the table. (NS: not sampled.)

	Statistical Week										
Watershed	16	17	18	19	20	21	22	23	24	25	26
Skagit [1] 1997-2001	43.2	48.3	50.6	51.7	56.1	59.0	58.0	60.3	61.7	66.5	68.0
Stillaguamish [2] 2001-2002	51.4	53.5	55.7	57.8	60.0	62.1	64.2	66.4	68.5	70.6	72.8
Cedar [3] 1998-2000	54.9	64.2	66.5	70.2	75.3	77.5	80.7	85.5	89.7	99.0	113
Green [4] 2000	52.1	57.2	59.6	63.1	68.1	69.5	NS	79.0	82.4	79.4	76.3
Puyallup [5] 2002	NS	NS	NS	66.2	62.0	70.3	73.7	72.7	78.7	80.0	82.3
Dungeness [6] 1996-1997	NS	NS	NS	NS	NS	NS	NS	NS	77.9	78.8	81.8
All Systems Average Length	50.4	55.8	58.1	61.8	64.3	67.7	69.2	72.8	76.5	79.0	82.4
Minimum Predator Length	153	169	176	187	195	205	210	221	232	239	250

Sources:

[1] Data are from Seiler et al. (1998); Seiler et al. (1999); Seiler et al. (2000); Seiler et al. (2001), and Seiler et al. (2002)..

[2] Data are from regression models presented in Griffith et al. (2001) and Griffith et al. (2003).

[3] Data are from Seiler et al. (2003).

[4] Data are from Seiler et. (2002).

[5] Data are from Samarin and Sebastian (2002).

[6] Data are from Marlowe et al. (2001).

Date of Release. The release date of juvenile fish for the program can influence the likelihood that listed species are encountered or are of a size that is small enough to be consumed. The most extensive studies of the migration timing of naturally produced juvenile chinook salmon in the Puget Sound ESU have been conducted in the Skagit River, Bear

Creek, Cedar River, and the Green River. Although distinct differences are evident in the timing of migration between watersheds, several general patterns are beginning to emerge:

1) Emigration occurs over a prolonged period, beginning soon after enough emergence (typically January) and continuing at least until July;
2) Two broad peaks in migration are often present during the January through July time period; an early season peak (typically in March) comprised of relatively small chinook salmon (40-45mm), and a second peak in mid-May to June comprised of larger chinook salmon;
3) On average, over 80% of the juvenile chinook have migrated past the trapping locations after statistical week 23 (usually occurring in the first week of June).

Table 3.5.2. Average cumulative proportion of the total number of natural origin juvenile chinook salmon migrants estimated to have migrated past traps in Puget Sound watersheds.

	Statistical Week										
Watershed	16	17	18	19	20	21	22	23	24	25	26
Skagit [1] 1997-2001	0.61	0.64	0.68	0.73	0.76	0.78	0.83	0.86	0.90	0.92	0.94
Bear [2] 1999-2000	0.26	0.27	0.28	0.32	0.41	0.52	0.73	0.84	0.92	0.96	0.97
Cedar [2] 1999-2000	0.76	0.76	.0.76	0.77	0.79	0.80	0.82	0.84	0.87	0.88	0.90
Green [3] 2000	0.63	0.63	0.64	0.69	0.77	0.79	0.84	0.86	0.88	0.98	1.00
All Systems Average	0.56	0.58	0.59	0.63	0.68	0.72	0.80	0.85	0.89	0.94	0.95

Sources:

[1] Data are from Seiler et al. (1998); Seiler et al. (1999); Seiler et al. (2000); Seiler et al. (2001), and Seiler et al. (2002)..

[2] Data are from Seiler et al. (2003).

3 Data are from Seiler et. (2002).

Release Location and Release Type. The likelihood of predation may also be affected by the location and type of release. Other factors being equal, the risk of predation may increase with the length of time the fish released from the artificial production program are commingled with the listed species. In the freshwater environment, this is likely to be affected by distribution of the listed species in the watershed, the location of the release, and the speed at which fish released from the program migrate from the watershed.

Coho salmon and steelhead released from western Washington artificial production programs as smolts have typically been found to migrate rapidly downstream. Data from Seiler et al. (1997; 2000) indicate that coho smolts released from the Marblemount Hatchery

on the Skagit River migrate approximately 11.2 river miles day. Steelhead smolts released onstation may travel even more rapidly – migration rates of approximately 20 river miles per day have been observed in the Cowlitz River (Harza 1998). However, trucking fish to offstation release sites, particularly release sites located outside of the watershed in which the fish have been reared, may slow migrations speeds (Table 3.5.3).

Table 3.5.3. Summary of travel speeds for steelhead smolts for several types of release strategies.

Location	Release Type	Migration Speed (river miles per day)	Source
Cowlitz River	Smolts, onstation	21.3	Harza (1998)
Kalama River	Trucked from facility located within watershed in which fish were released.	4.4	Hulett (pers. comm.)
Bingham Creek	Trucked from facility located outside of watershed in which fish were released.	0.6	Seiler et al. (1997)
Stevens Creek	Trucked from facility located outside of watershed in which fish were released.	0.5	Seiler et al. (1997)
Snow Creek	Trucked from facility located outside of watershed in which fish were released.	0.4	Seiler et al. (1997)

Number Released. Increasing the number of fish released from an artificial production program may increase the risk of predation, although competition between predators for prey may eventually limit the total consumption (Peterman and Gatto 1978).

Predation – Marine Environment

WDFW is unaware of any studies that have empirically estimated the predation risks to listed species posed by the program described in this HGMP. NMFS (2002) reviewed existing information on the risks of predation in the marine environment posed by artificial production programs and concluded:

> "1) Predation by hatchery fish on natural-origin smolts or sub-adults is less likely to occur than predation on fry. Coho and chinook salmon, after entering the marine environment, generally prey upon fish one-half their length or less and consume, on average, fish prey that is less than one-fifth of their length (Brodeur 1991). During early marine life, predation on natural origin chinook, coho, and steelhead will likely be highest in situations where large, yearling-sized hatchery fish encounter sub-yearling fish or fry (SIWG 1984)."

"2) However, extensive stomach content analysis of coho salmon smolts collected through several studies in marine waters of Puget Sound, Washington do not substantiate any indication of significant predation upon juvenile salmonids (Simenstad and Kinney 1978)."

"3) Likely reasons for apparent low predation rates on salmon juveniles, including chinook, by larger chinook and other marine predators are described by Cardwell and Fresh (1979). These reasons included: 1) due to rapid growth, fry are better able to elude predators and are accessible to a smaller proportion of predators due to size alone; 2) because fry have dispersed, they are present in low densities relative to other fish and invertebrate prey; and 3) there has either been learning or selection for some predator avoidance."

Competition

WDFW is unaware of any studies that have empirically estimated the competition risks to listed species posed by the program described in this HGMP. Studies conducted in other areas indicate that this program is likely to pose a minimal risk of competition:

1) As discussed above, coho salmon and steelhead released from hatchery programs as smolts typically migrate rapidly downstream. The SIWG (1984) concluded that "migrant fish will likely be present for too short a period to compete with resident salmonids."
2) NMFS (2002) noted that "..where interspecific populations have evolved sympatrically, chinook salmon and steelhead have evolved slight differences in habitat use patterns that minimize their interactions with coho salmon (Nilsson 1967; Lister and Genoe 1970; Taylor 1991). Along with the habitat differences exhibited by coho and steelhead, they also show differences in foraging behavior. Peterson (1966) and Johnston (1967) reported that juvenile coho are surface oriented and feed primarily on drifting and flying insects, while steelhead are bottom oriented and feed largely on benthic invertebrates."

3) Flagg et al. (2000) concluded, "By definition, hatchery and wild salmonids will not compete unless they require the same limiting resource. Thus, the modern enhancement strategy of releasing salmon and steelhead trout as smolts markedly reduces the potential for hatchery and wild fish to compete for resources in the freshwater rearing environment. Miller (1953), Hochachka (1961), and Reimers (1963), among others, have noted that this potential for competition is further reduced by the fact that many hatchery salmonids have developed different habitat and dietary behavior than wild salmonids." Flagg et al (2000) also stated "It is unclear whether or not hatchery and wild chinook salmon utilize similar or different resources in the estuarine environment."

4) Fresh (1997) noted that "Few studies have clearly established the role of competition and predation in anadromous population declines, especially in marine habitats. A major reason for the uncertainty in the available data is the complexity and dynamic nature of competition and predation; a small change in one variable (e.g., prey size) significantly changes outcomes of competition and predation. In addition, large data gaps exist in our

understanding of these interactions. For instance, evaluating the impact of introduced fishes is impossible because we do not know which nonnative fishes occur in many salmon-producing watersheds. Most available information is circumstantial. While such information can identify where inter- or intra specific relationships may occur, it does not test mechanisms explaining why observed relations exist. Thus, competition and predation are usually one of several plausible hypotheses explaining observed results."

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Beach #4 water is a stable 47 degrees and the beach utilizes 5 cfs. The hillside above the spring source has been unstable recently and has been armored with rock to stabilize it. The spring fed intake, on Forest Service property, feeds an aeration tower by gravity, then on to beach #4. The trout pond and raceways intercept this pipeline prior to the aeration tower and take their water here. The water sources are fish-free springs and are not screened. The similarity between the trout pond water supplies and the natal water supplies is not well known.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

There are no listed fish in the hatchery water supplies.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Adult coho are collected volitionally from approximately September/October through the end of December in the adult trap located at RM 0.5 on the Baker River at the outlet of Lake Shannon. The trap is small and there is no ability to segregate returning adults. Adults are transferred into fish tankers via a water-to-water system. Every coho is handled in a dip net and visually inspected and wanded for marks and CWT's. Power crowders are used to transfer the fish. Adults are hauled and placed into circular ponds (at RM 9) or into Baker Lake to spawn naturally. All other species, with the exception of chinook and hatchery steelhead, are hauled into Baker Lake to spawn naturally. The trapping site is on PSE land and is secure.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

Adults are transferred into fish tankers via a water-to-water system. Power crowders are used to transfer the fish. Adults are hauled into either the circulars at the trout pond (RM 9) or into Baker Lake to spawn naturally.

5.3) Broodstock holding and spawning facilities.

Adult coho are held in a 20' X 4' circular pond. The pond is covered with predator netting and sprinklers are not used.

5.4) Incubation facilities.

A vertical incubation facility was set up for the 2002 brood year and incubated/isolated 170,000 coho eggs.

5.5) Rearing facilities.

There are three 20' X 4' circular ponds fed by a 4" PVC line, two 8' X 100' X 3' raceways, two 12' X 10' circular ponds, two 14' X 3' X 3' intermediates and one 50' X 150' X 4' asphalt pond. As programs change, more equipment is being used.

5.6) Acclimation/release facilities.

Up to 120,000 fed fry are released into Sulphur Creek , a tributary to Lake Shannon. This is done by simply pulling screens and removing a stand pipe. The smolts are released by truck at various sites.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

The coho used to be incubated in pond trays and the egg to fry survival was low. There also has been a problem with the water line filling with gravel and decreasing flows enough to cause mortality.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

All unmarked chinook will be returned to the Skagit River and those trapped with a CWT'd will be made available to Marblemount for broodstock.. Unmarked chinook will be handled and loaded (with rubber fish tubes, water-to-water or with nets) and returned to the river as gently as possible to minimize stress and injury. Dolly Varden ("Bull Trout") will be handled in a similar manner but will be released into Baker Lake.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

Adults returning to the Baker River trap.

6.2) Supporting information.

6.2.1) History.

Orginally, fish from the Marblemount Hatchery were used for broodtstock. The intent now is to maintain the program utilizing naturally produced adults from the Baker River.

6.2.2) Annual size.

200 adults.

6.2.3) Past and proposed level of natural fish in broodstock.

Unknown level of natural fish in broodstock in the past. The intent now is to maintain the program utilizing naturally produced adults from the Baker River.

6.2.4) Genetic or ecological differences.

None

6.2.5) Reasons for choosing.

Local indigenous stock.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

Listed fish will not be spawned. If they are inadvertently trapped they will be returned quickly and without undue injury back to the river. See section 5.8 above.

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Adults

7.2) Collection or sampling design.

The coho for the program are collected entirely from volunteers to the Baker River trap. Adults from the entire run are trapped and incorporated proportionately into the spawning population . Adults are sexed at the trap and females are given a prophylactic injection of gallimycn for BKD.

7.3) Identity.

Program fish are selected only from coho volunteers at the Baker River trap.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

200 adults are needed annually to meet program requirements.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Year	To trap	Baker Lake	Broodstock	Eggs	Juveniles
1988					
1989					
1990					
1991					
1992					
1993	4,362			58,650	
1994	4,527			179,011	
1995	5,937			155,040	
1996	4,042			127,071	
1997	2,320			87,710	
1998	5,570	5,140	430	350,862	
1999	3,431	3,225	206	236,209	
2000	5,941	5,629	246	219,810	
2001	11,796	11,573	180	170,000	
2002	7,646	7,480	151	165,000	

Data source: Puget Sound Energy

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

The majority of the stock is placed into Baker Lake to spawn naturally.

7.6) Fish transportation and holding methods.

Adults are transferred into fish tankers via a water-to-water system. Power crowders are used to transfer the fish. All coho are sampled for fin clips and wanded for CWT's.

7.7) Describe fish health maintenance and sanitation procedures applied.

NA

7.8) Disposition of carcasses.

All carcasses of spawned-out adults and adult mortality are distributed into Baker Lake tributaries for nutrient enhancement of the watershed.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

See section 5.8 above.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

The coho for the program are collected entirely from volunteers to the Baker River trap. Adults from the entire run are trapped and incorporated proportionately into spawning population The majority of the run goes into Baker Lake.

8.2) Males.

Males are collected randomly from the trap and spawned, with a backup male, with a female.

8.3) Fertilization.

Females are spawned in 1:1 matings with backup males. All surplus coho not needed for the artificial part of program are allowed to spawn naturally in Baker Lake.

8.4) Cryopreserved gametes.

NA

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

NA

SECTION 9. INCUBATION AND REARING -

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

150,000 –170,000 eggs are collected with a survival rate to eye-up averaging 88%.

9.1.2) Cause for, and disposition of surplus egg takes.

See section 8.3.

9.1.3) Loading densities applied during incubation.

7,500 eggs per tray, with vexar, at 3 gallons per minute (gpm). Eggs are given a formalin treatment to limit fungal growth on dead eggs.

9.1.4) Incubation conditions.

Eggs are incubated in vertical incubators located at the sockeye spawning beach. The water for both facilities up-wells through the rock substrate. The temperatures at the site is stable and 47degrees.

9.1.5) Ponding.

Fry are removed fron the incubation trays and placed in a raceway with a lowered water level to crowd the fry to aid in feeding.

9.1.6) Fish health maintenance and monitoring.

Fish are looked at by WDFW pathologists and health care instructions are given to PSE.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

NA

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..

Mortality is less than .23% per month during the early fry stage. Total loss is less than 3% for each broodyear.

9.2.2) Density and loading criteria (goals and actual levels).

Coho are reared at or below a density of .3 pounds per cubic foot. Although in some cases fish have been reared at a higher level for a short period of time.

9.2.3) Fish rearing conditions

Coho are reared on Sulphur Springs water that is a constant 47 degrees Fahrenheit. Dissolved oxygen (DO) levels are at saturation (over 10 ppm). Turbidity is low except for occasional sediment infiltration (sand) at the source. Organic inputs are low. pH remains at a neutral level. The water does not suffer from fish pathogen problems.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

NA

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

NA

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Bioproduct semi-moist food is used. Size used is starter mash to 3.0 mm. Fry are fed to saturation throughout the day on a 7 day schedule. Feeding decreases in frequency as they grow. Feeding rates vary from 4% BW/day as fry to 1% BW/day as smolts. Food conversion efficiency varies from 1-1.3:1

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

Fish are looked at by WDFW pathologists and health care instructions are given to PSE. All tools are sanitized with PVP iodine due to the proximity of sockeye fingerlings.

9.24) Smolt development indices (e.g. gill ATPase activity), if applicable.

Gill ATPase activity levels have been conducted once in the past, but there are no plans to conduct annual ATPase level measurements.

9.2.8) Indicate the use of "natural" rearing methods as applied in the program.

None

9.2.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

NA

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels. *(Use standardized life stage definitions by species presented in **Attachment 2**. "Location" is watershed planted (e.g. "Elwha River").)*

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry	120,000	500-700	April/May	Sulphur Creek
Fingerling				
Yearling	60,000	17	June	Baker Lk, Lk Shannon and at mouth of Baker River

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: Baker Lake, Lake Shannon and Baker River

Release point: Baker Lake, Lake Shannon and mouth of Baker River.

Major watershed: Baker River

Basin or Region: Skagit River Basin, WRIA 3 and 4

10.3) Actual numbers and sizes of fish released by age class through the program.

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1988			65,000	300			155,000	15
1989							105,140	17
1990							37,409	19
1991							75,795	13
1992							148,464	16
1993			43,214	300			40,958	9
1994							48,876	14
1995			121,947	301			47,950	14
1996			82,840	894			20,967	16
1997			52,305	854			48,345	23
1998			23,912	590			18,627	13
1999			112,587	270			42,262	15
2000			139,523	307			59,297	20
2001			57,111	178			68,703	18
Average			79,180	462			65,557	16

Data source: Puget Sound Energy

10.4) Actual dates of release and description of release protocols.

The fed fry release is in April/May (migrate out of the lake the following June as smolts) while the smolts are released in June.

10.5) Fish transportation procedures, if applicable.

Fry are planted at the Sulphur Springs facility and smolts are taken from the raceways and collected at both gulpers and trucked to the mouth of the Baker River.

10.6) Acclimation procedures.

None.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

Fish (yearlings) destined for Baker Lake and Lake Shannon are freeze-branded and adipose-fin clipped only. The fish released at the mouth of the Baker River are adipose-fin clipped only. About 25,000 –30,000 wild smolts are coded-wire tagged only coming out of Baker Lake. Fed fry released from Sulphur Springs are not marked.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

In May, surplus fish over and above the 60,000 yearling program are released into Sulphur Creek and allowed to migrate to Lake Shannon.

10.9) Fish health certification procedures applied pre-release.

See section 9.2.7

10.10) Emergency release procedures in response to flooding or water system failure.

NA

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

To minimize the risk of residualization and impact upon natural fish, hatchery yearlings are released in June (same time as the natural fish coming out of the lake) as smolts. All fish reared and released as smolts are mass marked (adipose-fin clip only).

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

The success of fry and smolts, planted into the lakes, can be assessed by counting out-migrant smolts from the Baker River system and adults returning to the trap.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Funding is provided by Puget Sound Energy.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

SECTION 12. RESEARCH

12.1) Objective or purpose.

Currently investigating Baker Lake carrying capacity.
Ongoing fish passage evaluation.

12.2) Cooperating and funding agencies.

WDFW, PSE, SSC, USFWS, USFS, NMFS, NPS (National Park Service). This constitutes the Baker River Committee.

12.3) Principle investigator or project supervisor and staff.

Douglas Bruland – Staff Biologist
Mike Ficklin – Fisheries Technician
Charles Ledford – Fisheries Technician
Vivien Whitton – Fisheries Technician

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

12.6) Dates or time period in which research activity occurs.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

12.8) Expected type and effects of take and potential for injury or mortality.

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

12.10) Alternative methods to achieve project objectives.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

Table 1-A. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Chinook Salmon ESU/Population: Puget Sound Activity: Adult Trapping				
Location of hatchery activity: Baker R. Adult Trap Dates of activity: Apr. thru Nov. Hatchery program operator: Chuck Lavier, Mgr.				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)			Unknown	
Collect for transport b)		Unknown	Unknown	
Capture, handle, and release c)		Unknown	Unknown	
Capture, handle, tag/mark/tissue sample, and release d)			Unknown	
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)		Unknown	Unknown	
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Table 1-B. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Bull Trout ESU/Population: Puget Sound Activity: Adult Trap				
Location of hatchery activity: Baker R. Adult Trap Dates of activity: Jan. thru Dec. Hatchery program operator: Chuck Lavier, Mgr.				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)			Unknown	
Collect for transport b)			Unknown	
Capture, handle, and release c)			Unknown	
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
			Unknown	
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Instructions:

1. *An entry for a fish to be taken should be in the take category that describes the greatest impact.*
2. *Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).*
3. *If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.*